DOCUMENT RESUME

ED 093 719 SE 018 097

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INSTITUTION	New York State Education Dept., Albany. Bureau of Elementary Curriculum Development.
PUB DATE	[74]
NOTE	8p.
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The rationale behind the use of mathematics laboratories is stated, then directions for organizing and implementing a math lab are given. Topics such as housekeeping, keeping an inventory, noise level, record keeping and assignments, giving grades, correlating textbooks with a math lab, and finding meaningful laboratory problems are each discussed briefly. A bibliography of 13 references on math labs is included. (DT)

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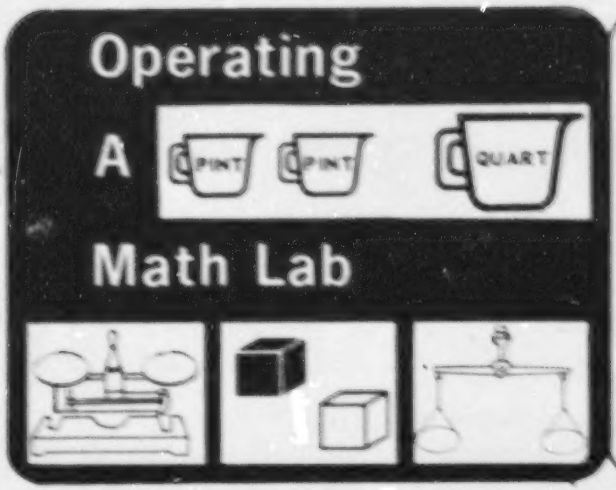

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THE INGREDIENTS

Recipe for a Successful Math Lab:

1 group of children

1 enthusiastic teacher

1 space (corner, closet, classroom, school year, community)

1 set of appropriate, attractive materials (plain and/or fancy, commercially and/or home-made)

1 set of interesting problem resources (human, art and crafts, business, government, sports and games, literature, newspapers, textbooks from the fields of physical and social sciences, and of course, arithmetic)

Directions:

Add, subtract, multiply, and divide the ingredients to suit your taste and pocketbook. Season with a pinch of imagination, mix well, and allow sufficient time for concepts to gel.

Size and/or quantity varies greatly.

In essence, each lab director must design a flexible program tailored to suit his needs and those of his students, within the bounds of the available physical facilities and human talents. The formula that guarantees a perfect pedagogical environment has yet to be found.

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MATH LAB RATIONALE

Our schools have an obligation to equip children with basic computational skills. It is possible, though surely not desirable, to train children to perform only "how to" tasks (the kind that can be performed on a calculating machine) without broaching the "why to" tasks--genuine problem solving, conceptual, and cultural aspects--that constitute the true study of mathematics.

Learning theorists, such as Zoltan Dienes, Jean Piaget, Jerome Bruner, and Robert Gagne generally subscribe to a discovery approach to mathematics learning. Their investigations have emphasized that sensory experiences are vital precursers of learning. In particular, mathematics learning and retention are facilitated by experiences with concrete objects. Furthermore, their research indicates that students learn better when they are actively involved in investigating problems than when they are passive listeners to lectures on the problems.

MAKING MATH LABS WORK

(Check the bibliography for sources that offer detailed descriptions of physical layouts for labs and their furnishings.)

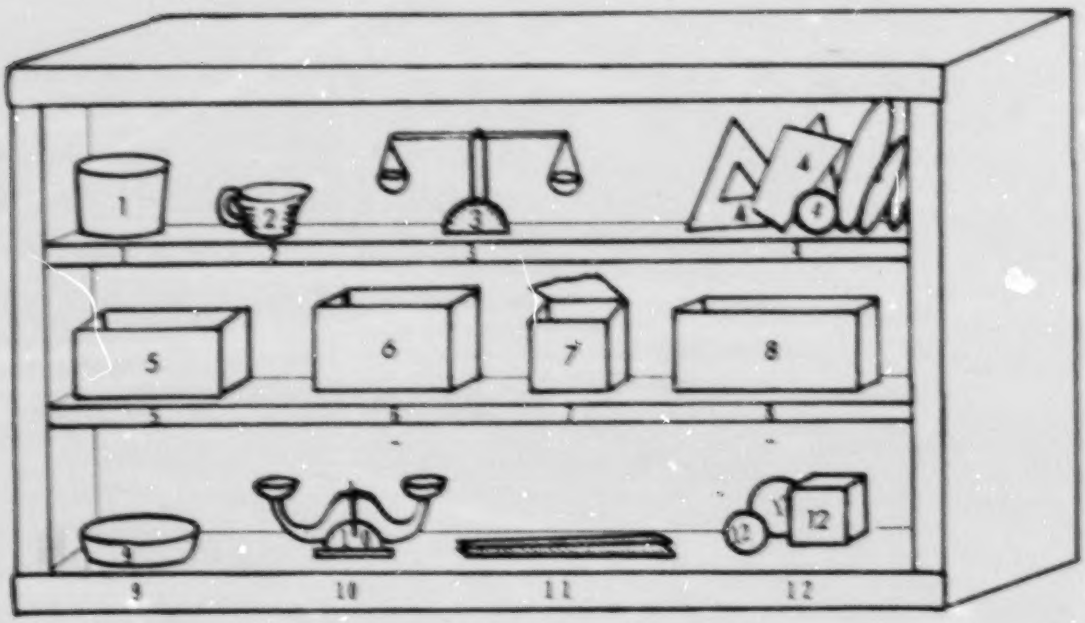
How To Start

SLOWLY. The teacher can introduce a whole class or a small group of children to one problem, game, or measuring tool. Gradually, the teacher can increase both the number of small, independent working groups and the time the children spend on their investigations. It may seem paradoxical, but the free, open, activity-oriented atmosphere of a Math Lab depends on the careful planning and structuring of the environment by the teacher. In other words, the teacher must be flexible and open-minded, but not so open-minded that his brains fall out.

How To Do Housekeeping

EFFICIENTLY. Right from the start, as an essential routine in the Math Lab, each child must be made to feel a sense of pride and responsibility in the maintenance of the Lab. Each must do his share in observing common courtesies and in returning the equipment he has used to its proper place in good condition, ready for the next child to enjoy.

A natural organization of materials is achieved when a centralized lab room is partitioned into project centers such as weighing, geometry, capacity, cooking, shop, browsing, computers, etc.



Colored, numbered labels which match shelves with equipment (checkroom style) can help even non-readers return their materials correctly.

A checkoff list of game pieces can be pasted onto each game box lid.

A file cabinet can store unfinished projects, directions for games, small or fragile items, and much more. Storage units can be improvised from vegetable baskets, shoe boxes, clear plastic bags, clotheslines, etc.

The librarian can be most helpful in suggesting ways to maintain "a place for everything and everything in its place."

How To Keep An Inventory (Literature, Supplies, Equipment)

UP-TO-DATE. A readily accessible inventory list is practically a necessity in a centralized lab room and would be helpful in the regular classroom.

Each item can be listed on a separate 3x5 index card along with mathematics topic(s) which it reinforces. These cards should be filed alphabetically. A separate cross-reference index file with topical headings should also be kept.

A summary chart correlating games with mathematical objectives such as that illustrated below can be posted in the game corner.

	COUNTING	ESTIMATION	FRACTIONS	GEOMETRY	GRAPHS	MEASUREMENT	NUMERATION	PLACE VALUE	PROBLEM SOLVING	SETS	WHOLE NUMBERS
Attribute Games	X		X	X	X	X			X	X	X
Battleship	X			X	X				X		
Bingo	X	X	X		X						X
Competitive Fractions			X	X					X		
Cover Up		X									X
Dominoes	X	X	X	X		X	X	X		X	X
Inch by Inch	X					X					X
Kalah	X	X	X						X		X
Racko						X	X	X			
Snag	X				X		X	X			
Tangrams			X	X		X			X	X	
Tuf			X	X							X

Noise Level

MODULATE IT. In an activity-oriented mathematics classroom, the movement of equipment, group discussions, and excited vocal reactions to games all contribute to a higher noise level than might be expected in a traditionally organized room. The children will be encouraged to moderate their tones and discipline themselves (and, incidently, their more mischievous peers) when they have purposeful tasks to perform.

A well-equipped Math Lab can be bewildering to a child if he receives no direction.

How To Do Recordkeeping and Assignments

KEEP IT SIMPLE. Children may be encouraged to keep a log of their activities, such as:

November 5 - Joan and I flipped a penny 74 times. We got 38 heads and 36 tails. The number of heads and tails were almost the same.

November 12 - Learned about penny flipping and probability.

November 19 - Took short quiz on fractions. Score - 6 out of 10. Could be better.

For each unit, task cards and other assignments can be color-coded to follow the spectrum for identifying progress from easy to difficult work. (Red, orange, yellow, green, blue, violet.)

Some teachers have utilized a contract system where the teacher and the child agree on a block of work that can be reasonably accomplished during a specified time span.

Some teachers have found a cork or chalkboard effective when arranged with assignment headings and a name card posted below for each child.

Capacity Center	Wood Shop	Game Corner
Jim Abe	Eric Kathy	Bill Tony Jane
Weighing Center	Arithmetic Practice	Cooking Corner
Debbie Andi	Nancy Terry	Lisa Lee Gary

Some teachers prefer to keep a central record book which may be arranged either according to topics to be studied or with a profile page for each child's achievement.

How To Give Grades

SUPPORTIVELY. Via a plethora of available standardized testing devices and teacher-made written exams, the mechanical aspects of students' mathematics achievements are most often evaluated. However, even the most avid behavioral objectives proponents acknowledge that the affective aspects of mathematical instruction have eluded formal methods for measuring achievement.

To assess these intangible evidences of growth, a conference with child, teacher, and parents can promote far greater understanding and appreciation of the child's complete education. Examples of the child's work and the teacher's anecdotal notes, as well as traditional evaluation instruments, can be discussed. Particularly at the elementary level, the child's school work is not segmented according to subject disciplines, but merges into a cohesive learning gestalt. It is almost impossible to translate this complex development solely in terms of a number or letter grade.

How To Correlate Textbooks With a Math Lab

COMPATIBLY. Mathematics learning involves sequentially structured studies of number, geometry, and measurement. Good textbooks give the teacher organized guidelines for the math skills and concepts to be presented during the term. Texts also are a source of reinforcement materials. However, textbooks generally provide just a skeletal foundation for a thought-provoking course of study, which needs to be "fleshed out" and have life breathed into it. Such an enhancement of the curriculum can be realized with the Math Lab approach, which capitalizes on the use of the natural experiences of children to develop the basic ideas of mathematics.

How To Find Meaningful Laboratory Problems

COOPERATIVELY. The interests of the children serve as a primary source for designing exploratory activities. For almost every field, a mathematical connection can be developed by considering such things as measurements, costs, shapes, estimations, probability, and pictorial representation.

A weekly puzzle contest can involve every child in the school, and perhaps his parents as well. Copies of the puzzle could be duplicated and made easily available.

There are many sets of good commercially prepared task cards and four New York State Education Department publications* which suggest diverse Math Lab problems for children to pursue. Beyond these sources, both teachers and students can write and illustrate their own personalized project specifications.

Math Lab activities have been compared with an Indian Rain Dance--everyone has a lot of fun and sometimes it rains and sometimes it doesn't. If the sole outcome of the Math Lab program is that children learn to enjoy mathematics, the program has served them well.

The Bureau of Elementary Curriculum Development and the Bureau of Mathematics Education, in cooperation with ESEA Title I, have developed a variety of materials on the use of a math lab approach at the elementary level. The original material from which this publication was developed was written by Elaine Mintz, Director of Elementary Mathematics, in the Plainedge School District. Fredrick Paul, Bureau of Mathematics Education, reviewed the original manuscript.

Peter A. Martin of the Bureau of Elementary Curriculum Development did the final editing and prepared the material for publication.

*See bibliography

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